

- 1 1. (currently amended) A database management system including a processor and persistent  
2 storage, the processor executing code for the database management system and the persistent  
3 storage containing database objects that are manipulated by the processor when executing the  
4 code for the database management system.  
5 the data base management system having the improvement comprising:  
6 database objects in the persistent storage that are bitmap values, a bitmap value having  
7 a representation of a bitstring wherein set bits specify a set of the database objects whose  
8 definitions are built into the database management system, and  
9 bitmap operations implemented in the code for ~~provided by~~ the database management  
10 system, a bitmap operation having a user-specified operands which ~~are~~ is a bitmap value and/or  
11 a sets of objects.
- 1 2. (previously presented) The database management system set forth in claim 1 wherein the  
2 bitmap operations comprise at least:  
3 a set-to-bitmap operation wherein a bitmap value is derived from a set of the objects  
4 specified in an operand.
- 1 3. (previously presented) The database management system set forth in claim 2 wherein:  
2 the derived bitmap value is a new bitmap value that specifies the objects in the  
3 specified set.
- 1 4. (previously presented) The database management system set forth in claim 2 wherein:  
2 the derived bitmap value is a preexisting bitmap value which now further specifies the  
3 objects in the specified set.
- 1 5. (previously presented) The database management system set forth in claim 2 wherein:  
2 the derived bitmap value is a preexisting bitmap value which now no longer  
3 specifies any objects in the specified set.

1 6. (previously presented) The database management system set forth in claim 1 wherein the  
2 bitmap operations comprise at least:

3 a bitmap-to-set operation wherein the set of objects specified in a bitmap value  
4 specified in an operand is derived from the specified bitmap value.

1 7. (previously presented) The database management system set forth in claim 1 wherein the  
2 bitmap operations comprise at least:

3 a bitmap-to-count operation wherein the number of the objects in the set specified in a  
4 bitmap value specified in an operand is derived from the specified bitmap value.

1 8. (previously presented) The database management system set forth in claim 1 wherein the  
2 bitmap operations comprise at least:

3 an existence operation wherein a value representing the logical value TRUE is returned  
4 when an object specified in an operand belongs to the set of the objects represented by a  
5 bitmap value specified in another operand.

1 9. (previously presented) The database management system set forth in claim 1 wherein the  
2 bitmap operations comprise at least:

3 a logical operation on a first bitstring from a first bitmap value specified in an operand  
4 and a second bitstring from a second bitmap value specified in another operand.

1 10. (previously presented) The database management system set forth in claim 1 wherein the  
2 bitmap operations comprise at least:

3 a comparison operation on a first bitmap value specified in an operand and a second  
4 bitmap value specified in another operand wherein a value representing the logical value  
5 TRUE is returned when the first bitmap value and the second bitmap value specify the same set  
6 of objects.

1 11. (previously presented) The database management system set forth in claim 1 wherein:

2 the bitmap values include settable bitmap values; and

3 the bitmap operations comprise at least an assignment operation which sets a target  
4 settable bitmap value specified in an operand from a source bitmap value specified in another  
5 operand.

- 1   **12. (original)** The database management system set forth in claim 1 wherein:  
2           the bitmap values include bitmap values that are persistent in the database management  
3   system.
- 1   **13. (previously presented)** The database management system set forth in claim 12 wherein:  
2           the persistent bitmap values include bitmap values in user-specified fields of tables of  
3   the database management system.
- 1   **14. (previously presented)** The database management system set forth in claim 1 wherein:  
2           the bitstring in the bitmap value is compressed.
- 1   **15. (original)** The database management system set forth in claim 1 wherein:  
2           the objects are identifiers for other objects that exist in the database management  
3   system.
- 1   **16. (original)** The database management system set forth in claim 15 wherein:  
2           the identifiers for the other objects are row identifiers of rows in the database  
3   management system.
- 1   **17. (original)** The database management system set forth in claim 16 wherein:  
2           the row identifiers are row identifiers returned by a user-defined query executed in the  
3   database management system.
- 1   **18. (original)** The database management system set forth in claim 17 wherein:  
2           the query returns a row identifier when a field in the row has an attribute specified in  
3   the query,  
4   whereby the bitmap value represents the set of fields having the specified attribute.
- 1   **19. (original)** The database management system set forth in claim 1 wherein:  
2           the objects are identifiers for other objects that exist outside the database management  
3   system.

1 20. (original) The database management system set forth in claim 19 wherein:  
2 the identifiers for objects that exist outside the database management system are  
3 electronic product codes for product items.

1 21. (original) A data storage device, the data storage device being characterized in that:  
2 the data storage device contains code which, when executed in a computer system,  
3 implements the database management system set forth in claim 1.

1 22. (previously presented) A bitmap value employed in a database management system, the  
2 bitmap value representing a first subset of a second subset of objects that are defined in the  
3 database management system, and  
4 the bitmap value comprising:  
5 a mapping specifier that maps a string of bits to the second subset; and  
6 a representation of the string of bits wherein a bit is set in the represented string of bits  
7 when the member of the second subset that is mapped to the bit belongs to the first subset and  
8 the database management system providing at least a first operation which permits users of the  
9 database system to specify the mapping of the string of bits to the second subset and a second  
10 operation which permits users to directly specify setting bits of the string of bits that  
11 correspond to the first subset.

1 23. (original) The bitmap value set forth in claim 22 wherein:  
2 the second objects are ordered.

1 24. (previously presented) The bitmap value set forth in claim 23 wherein:  
2 the order of the objects corresponds to values of the objects;  
3 the mapping specifier specifies the mapping by specifying one or more ranges of the  
4 values of the objects to which the string of bits is mapped; and  
5 the representation of the string of bits represents strings of bits corresponding to the  
6 ranges.  
7

1 25. (original) The bitmap value set forth in claim 24 wherein:

2           the mapping specifier specifies the range of the values by specifying a start value and  
3 an end value.

1   **26. (original)** The bitmap value set forth in claim 24 wherein:

2           the values include a prefix which determines a range of the values; and  
3           the mapping specifier specifies the range of the values by specifying the prefix for the  
4 range.

1   **27. (original)** The bitmap value set forth in claim 26 wherein:

2           the mapping specifier further specifies the range of the values by using a start value and  
3 an end value to specify one or more subranges of the range specified by the prefix.

1   **28. (canceled)**

1   **29. (previously presented)** The bitmap value set forth in claim 22 wherein:

2           the objects are electronic product codes.

1   **30. (original)** The bitmap value set forth in claim 22 wherein:

2           there is a plurality of the bitmap values in the database management system; and  
3 certain of the bitmap values are persistent in the database management system.

1   **31. (previously presented)** The bitmap values set forth in claim 30 wherein:

2           the persistent bitmap values include bitmap values in user-specified fields of tables of  
3 the database management system.

1   **32. (original)** The bitmap value set forth in claim 22 wherein:

2           the representation of the bitstring is a compressed representation thereof.

1   **33. (previously presented)** The bitmap value set forth in claim 22 wherein:

2           there is a plurality of the bitmap values in the database management system; and  
3           the database management system provides further user-accessible operations on the  
4 bitmap values.

1 34. (previously presented) The bitmap value set forth in claim 33 wherein:  
2 certain of the user-accessible operations alter the range specifier and the representation  
3 of the bitstring as required to map the represented string of bits to a second subset that is  
4 required for the operation.

1 35. (original) A data storage device, the data storage device being characterized in that:  
2 the data storage device contains code which, when executed in a computer system,  
3 implements the bitmap value set forth in claim 22.

1 36. (currently amended) A method employed in a database system of making a bitmap value  
2 that represents a first subset of a second subset of objects that are defined in the database  
3 management system,  
4 the method comprising the steps performed in the database system of:  
5 performing a first operation provided by the database system to users of the system, the  
6 first operation mapping a bitstring that is represented in the bitmap value onto the second  
7 subset; and  
8 performing a second ~~such~~ operation; provided by the database system to users of the  
9 system, the second operation setting the bits in the bitstring that correspond to the first subset.

1 37. (canceled)

1 38. (previously presented) The method set forth in claim 36 wherein:  
2 the objects are electronic product codes.

1 39. (previously presented) The method set forth in claim 36 wherein the objects are ordered  
2 and the step of performing the first operation comprises the steps of:  
3 making a range specifier that specifies a range of the objects; and  
4 mapping the bits in the bitstring to the specified range.

1 40. (original) The method set forth in claim 39 wherein the step of making a range specifier  
2 includes the step of:  
3 making a start value and an end value which together specify the range.

1   **41.** (original) The method set forth in claim 39 wherein the step of making a range specifier  
2   includes the step of  
3       making a prefix value which specifies the range.

1   **42.** (original) The method set forth in claim 36 further comprising the step of:  
2       compressing the bitstring.

1   **43.** (original) A data storage device, the data storage device being characterized in that:  
2       the data storage device contains code which, when executed in a computer system,  
3   implements the method set forth in claim 36.

1   **44.** (previously presented) A bitmap value employed in a database management system to  
2   represent a first subset of the row identifiers defined in the database management system,  
3       the bitmap value comprising:  
4       a mapping specifier that maps a string of bits to a second subset of the set of row  
5   identifiers, the second subset including the first subset; and  
6       a representation of the string of bits wherein a bit is set in the represented string of bits  
7   when the member of the second subset that is mapped to the bit corresponds to a member of  
8   the first subset, the database management system providing at least a first operation which  
9   permits users of the database system to directly specify the mapping of the string of bits to the  
10   second subset and a second operation that permits users of the database system to directly  
11   specify setting bits of the string of bits that correspond to the first subset; and  
12       the first subset is returned by a user-defined query executed by the database  
13   management system.

1   **45.** (previously presented) The bitmap value set forth in claim 44 wherein:  
2       the first operation dynamically alters the mapping specifier such that the string of bits is  
3   mapped to a second subset that includes the first subset.

1   **46.** (previously presented) The bitmap value set forth in claim 44 wherein:  
2       the first subset is returned by a query which returns a row identifier when a field  
3   identified by the row identifier has an attribute specified in the query,

- 4 whereby the bitmap value represents the set of fields whose values have the specified attribute.
- 1 47. (original) A data storage device, the data storage device being characterized in that:
- 2 the data storage device contains code which, when executed in a computer system,
- 3 implements the method set forth in claim 44.